



1961

# The Effect of Group Phonics Drill on Non-Verbal Sub-Tests of the Kuhlmann-Anderson Intelligence Tests, Form D.

Alvaro Jimenez  
*Loyola University Chicago*

## Recommended Citation

Jimenez, Alvaro, "The Effect of Group Phonics Drill on Non-Verbal Sub-Tests of the Kuhlmann-Anderson Intelligence Tests, Form D." (1961). *Master's Theses*. Paper 1593.  
[http://ecommons.luc.edu/luc\\_theses/1593](http://ecommons.luc.edu/luc_theses/1593)

This Thesis is brought to you for free and open access by the Theses and Dissertations at Loyola eCommons. It has been accepted for inclusion in Master's Theses by an authorized administrator of Loyola eCommons. For more information, please contact [ecommons@luc.edu](mailto:ecommons@luc.edu).



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 License](https://creativecommons.org/licenses/by-nc-nd/3.0/).  
Copyright © 1961 Alvaro Jimenez

THE EFFECT OF GROUP PHONICS DRILL ON NON-VERBAL SUB-TESTS  
OF THE KUHLMANN-ANDERSON INTELLIGENCE TESTS, FORM D

by

Alvaro Jimenez, S.J.

A Thesis Submitted to the Faculty of the Graduate School  
of Loyola University in Partial Fulfillment of  
the Requirements for the Degree of  
Master of Arts

June

1961

## LIFE

Alvaro Jimenez, S.J. was born in Bogota, Colombia, October 29, 1926.

He was graduated from Colegio del Sagrado Corazon de Jesus, Santa Rosa de Viterbo, September 1950, with the degree of Bachiller en Letras Clasicas. He was graduated from Pontificia Universidad Javeriana, Bogota, with the Licentiates in Philosophy (Ph.L.), November, 1950, and in Theology (S.T.L.), November, 1957, and he received the Licentiates in Philosophy and Letters in September, 1958, at the same University.

From 1951 to 1954 the author taught Biology and Modern Languages at Colegio de San Ignacio, Medellin, Colombia. In 1959 he was a professor of Theology in the Pontificia Universidad Javeriana, Bogota. He began his graduate studies at Loyola University in January, 1960.

## TABLE OF CONTENTS

Chapter	Page
I. PURPOSE OF THE PRESENT STUDY . . . . .	1
II. REVIEW OF THE LITERATURE . . . . .	7
III. THE MEASURING INSTRUMENTS . . . . .	16
IV. THE PROCEDURE . . . . .	18
V. THE RESULTS . . . . .	22
VI. SUMMARY AND CONCLUSIONS . . . . .	28
BIBLIOGRAPHY . . . . .	30

# LIST OF TABLES

Table	Page
I. I.Q. SCORES OF EXPERIMENTAL AND CONTROL GROUPS BEFORE AND AFTER AUDIO VISUAL PHONICS DRILL . . . . .	5
II. STATISTICAL RESULTS OF TRANSFER EXPERIMENTS FROM 1890 to 1940 . . . . .	13
III. TEST SCORES IN MEAN MENTAL-AGE MONTHS FOR EXPERIMENTAL AND CONTROL GROUPS BEFORE AUDIO-VISUAL PHONICS DRILL SESSIONS. .	22
IV. PRODUCT-MOMENT CORRELATIONS BETWEEN THE SCORES IN THE KUHLMANN-ANDERSON BEFORE AND AFTER PHONICS DRILL . . . . .	23
V. PRE-TEST AND POST-TEST SCORES IN MEAN MENTAL-AGE MONTHS, GAINS IN TESTS SCORES AND SIGNIFICANCES OF DIFFERENCES FOR THE EXPERIMENTAL AND THE CONTROL GROUPS IN VERBAL AND NON-VERBAL SUB-TESTS OF THE K-A . . . . .	25
VI. NET GAINS AND SIGNIFICANCES OF DIFFERENCES BETWEEN EXPERIMENTAL AND CONTROL GROUPS IN MEAN MENTAL-AGE MONTHS FOR VERBAL AND NON-VERBAL SUB-TESTS, AS SHOWN BY $t$ TEST AFTER PHONICS DRILL SESSIONS . . . . .	26

## CHAPTER I

### PURPOSE OF THE PRESENT STUDY

The present study aims to investigate the effect of group phonics drill on the performance of the non-verbal subtests of the Kuhlmann-Anderson intelligence tests, and know whether or not some "transfer of training" occurs, as the results of a previous study (23) seem to indicate.

Transfer of training is not to be confused with the problem of formal discipline, although it is closely related to it. The theory of formal discipline proposes that the study on some subject matters can contribute to proficiency in any specialty. It would hold that the "faculties" of the mind may be trained by the study of special subject matter; the more difficult the task to be performed, the greater the disciplinary value.

Transfer of training is a much narrower concept. It can be described as "a process of acquiring ideas, informations, skills in one situation and applying this knowledge to other situations whether similar or different." (11) It is the utilization of previously gained experience in a practical situation. Today many modern psychologists do not accept the original theory of formal discipline, but mostly they do accept the fact of transfer of training.

The distinction between formal discipline and transfer of training is important in education. The design of curricula and the teaching of methods have been largely influenced by recognition of this distinction. The differences between the advocates of the "traditional schools" and the new or

"progressive education" is but one application of this problem.

If an educator belongs to the former group, he believes that the educational spread of subjects, such as Latin, mathematics and the sciences, is greater, say, than the spread of drawing, dancing, or typewriting. The traditional subjects are more educative. If one belongs to the progressive school, he believes that it is the child's enthusiastic interest in a pursuit that gives it educational value. The best subjects are those the child wishes to study, not those he is made to study (31).

Among the complex factors that contributed to the shift from formal discipline theory by many psychologists and educators, the discredit of the faculty psychology can be mentioned, as well as a multitude of experiments on transfer of training and the interpretation given to them. Classics and mathematics were taught for centuries, not only because of their cultural content but also because they were held to facilitate learning of other subjects (16).

The doctrine of formal discipline was first proposed by Palto (30). In the Republic, Bk. VII, we find the following:

those who have a turn for arithmetic are, with scarcely an exception, naturally quick at all sciences; and men of slow intellect, if they be trained and exercised in this study, even supposing they derive no other benefit from it, at any rate progress so far as to become invariably quicker than they were before.

Through the influence of the Greeks, the belief in the formal discipline of certain subjects persisted. According to Locke, formal discipline should be the best aim of education; Latin and Greek should be studied in order to discipline the mind (11). The pioneer experiments of James (16) on memory (1890) directed attention to the often wasteful process of indirect training.

The doctrine of formal discipline started losing its popularity in favor of specific training.

Since the time of James many experimental studies on transfer have been made. As a result of his studies, Thorndike formulated the famous theory of "identical elements" in 1903, as Woodworth (41) remarks. Thorndike stated that transfer was possible only as far as identical elements of performance could be carried over from one task to another. Opposed to the doctrine of Thorndike is the theory of "generalization of experience" proposed by Judd. In 1908 Judd (17) wrote:

mental functions are interrelated and interdependent in the most manifold ways. Sometimes the training of an attitude aids the positive development of certain other attitudes. Sometimes one function interferes with other functions. Above all stands the fact that every experience changes the individual's capacity for new experiences.

In this theory, method of teaching and studying are the most important factors; subject matter is of lesser importance.

A tremendous amount of investigation has been done since Thorndike and Judd formulated their respective theories of transfer; but almost all the points of view of the investigators can be classified as supporting or modifying one or the other of these two theories, or trying to compromise between them. These two major theories have had far-reaching influence upon educational practice. As a result of the theory of identical elements, specific education, mechanization and automatization have been emphasized to the extreme (11). Judd's theory has stressed purposiveness and flexibility. According to this theory, among the factors which are carried over from previous training the following can be enumerated, as summarized by Orata: generalization of methods of procedure, ideals and attitudes, habits,



techniques and modes of attack, reflection, concentration and attention, association and adaptation to situations.

Today modern psychologists accept transfer of training. But, as Woodworth (41) remarks:

In human instances of transfer of training, it is not at all easy to see what elements of skill, knowledge, understanding or emotional adjustment have been carried over, though a pronounced transfer effect is demonstrated.

The conditions under which transfer takes place, the amount of transfer, the specific performances affected by previous learning are still a challenge for investigation.

With this general introduction, the purpose of the present study can be better understood. This research aims to supplement a previous study conducted by Luser, Stanton, and Doyle (23, 34). They studied the "Effect of an Audio-Visual Phonics Aid in the Intermediate Grades" in four schools of the Chicago area. Two hundred and fourteen fourth graders were divided into a control and an experimental group. The experimental group received forty-three drill sessions in phonics with uniform phonographic records and individual charts. Computation of the standard error of the gains was used to analyze the data. The experimental group showed statistically significant gains in oral reading, paragraph meaning, and spelling. No significant gain was found in word meaning. The unexpected results for the I.Q. in the K-A intelligence tests are presented in Table I. Allowing for practice effect much greater than that shown by the control group, a gain of three IQ points was set as significant. The net difference in gain was still as high as 5.50. This gain is statistically significant at .001 level of confidence. Consequently the audio-visual phonics drill markedly influenced the performance on the K-A. The unexpected gains in

IQ points suggested that "improved habits of attention from group drill sessions may have contributed in part to more successful performance on the K-A retests of the experimental group." (23)

TABLE I

IQ SCORES OF EXPERIMENTAL AND CONTROL GROUPS BEFORE  
AND AFTER AUDIO-VISUAL PHONICS DRILL  
(Taken from Luser et al. and arranged)

Groups	Pretest		Post-test		Gain
	M	S.D.	M	S.D.	
Experimental (N = 105)	88.3	11.2	94.5	11.9	6.2
Control	92.3	11.0	93.0	13.0	0.7
Net differences in gain					5.5. $t = 4.91$ P .001

Transfer of training seems to be suggested here. The remark about the improved habits of attention, suggested by the authors, remains unsolved. It can be asked: Do the IQ gains for the experimental group appear only in the verbal subtests of the K-A, or are also the non-verbal subtests significantly improved? If the first alternative is true, the significant gain of IQ can be attributed to the greater familiarity of the students with the printed word. It seems clear that performance on a group test of intelligence is partially dependent on the pupil's familiarity with the printed word, if the test has some verbal items. So, a gain on IQ points is expected on the verbal subtests

after the phonics drill. A transfer of "identical elements" --verbal material-- from the audio-visual training to the retest situation could be proposed as an explanation of the unusual gain in IQ points, if this occurred only in the verbal subtests of the experimental group. But if there is also a significant gain in the non-verbal subtests, this would seem a case of transfer of training in common elements. If the non-verbal subtests are significantly improved, it seems that a satisfactory explanation of this fact would be that better attitudes and improved habits of attention and concentration, established or aided by the oral teaching in the phonics drill, enabled the children to perform more adequately under the group instructions given orally for retest on the K-A.

The null hypothesis of the present study may be stated thus:

No significant difference between scores on verbal and non-verbal subtests of the K-A intelligence tests can be expected to result from the use of formal phonics drill enriched by audio-visual aid.

## CHAPTER II

### REVIEW OF THE LITERATURE

Of immediate importance is the study reported by Luser et al. (6, 34) which was mentioned above; it will be mentioned again in a later chapter because the original data used in that study furnished the raw material for the present study. A summary of the literature on transfer of training follows.

This material is extremely abundant. Good reviews have been provided by Thorndike in 1926 (38), Woodworth (41) in 1938, Orata (27) in 1928 and 1941 (28), Hovland (15) in 1951, Gibson (13) in 1953, and Kingsley (19) in 1957. So the present review will enumerate only some important experiments on transfer of training with human subjects and describe briefly some of the most significant.

The scientific study of transfer of training began with the psychophysicists. As Woodworth (41) reports, E. H. Weber observed that some children trained to write with the right hand were able to produce mirror-writing with the left hand. Weber's observations were published by Fechner in 1858 with additional observations of his own. Weber also reported the practice of a well-known surgeon who trained his students to perform delicate operations with the left hand, so that in a given case they would be able to repeat the operation with the right hand without further training. Since then, bilateral transfer, or cross education, has been recognized and carefully investigated.

Outstanding experiments in the field have been performed by Scripture,

Smith, and Brown on steadiness of hand, Woodworth on ability to hit a target, and Starch and Ewert on mirror drawing, as Cook (7) reports. Woodworth (41) reports the early experiments of A. W. Volmann on the transfer of tactual discrimination in 1858, and those of Massenge in 1903 and Boring in 1920 on the same subject. Bilateral transfer of sensory and motor skills has been studied by many different methods: Bray (4) used a target reflected in a mirror; a star-shaped figure seen in a mirror has been used in many studies, v.g. in those of Cook (7) who performed some of the most extensive studies on cross-education.

Apart from cross-education and sensory discrimination, tasks including perception and observation have been another popular field of study on transfer of training. These studies are more closely related to the present research. As an example, the studies of Coover and Angel (8) can be mentioned. They tested the ability of some subjects to discriminate shades of gray, before and after practicing discrimination in intensities of sound. In most cases, there was a significant gain, from which the authors concluded that improvement was due to "divesting the essential process of the unessential factors," and to habituation to experimental conditions.

Whipple in 1910 and Foster in 1912 concluded that transfer occurs only in proportion to similarity of tasks, as Davis (11) reports.

McClellan (24) conducted an experimental study of the effect of the introduction of an intellectual factor in a problem of the motor learning type with a group of forty-eight college sophomores. He made a comparison of the results of two mazes when learned after an unrelated and after a related maze. Summarizing the results of the experiment he says that

the introduction of a relation into motor learning task results in improved scores, an indication that man can do better work, even in a motor task, through the proper use of his intellectual powers.

Memory training has been another ordinary field for experiments on transfer, since the studies of William James (16). He concluded that one's innate memory could not be improved by practice and that any improvement was due to the acquisition of more efficient methods of recording data and facts. As it was remarked above, the belief in formal discipline was emphatically called in question by the experiments of James.

Fide Woodworth (41), Ebert & Meumann found a great improvement in memorizing nonsense syllables, which they attributed to various devices learned by the subjects, to the elimination of worry, and to a greater self-confidence and adaptation to the experimental situation.

A three group method was employed successfully by Woodrow (40) in 1927. A control group received no training in memorizing, but took the six tests of memory that the other two groups took both at the beginning and at the end of the experiment. Two experimental groups spent some time memorizing poetry and nonsense syllables; the difference between these two experimental groups was that the first group divided the time between receiving instruction in good methods of memorizing and performing exercises using these methods, while the second group got no such instruction and spent the whole time practicing. This last group performed better than the control group in subsequent memory tests; but the group given instructions showed much more marked improvement than the other two. This gain was attributed to proper methods of memorizing, such as learning by wholes, attention to meaning, use of images and symbols to embody meaning, confidence in one's ability to memorize, etc.

Extremely important experiments on transfer were those of Thorndike, in collaboration with Woodworth and some other workers, because they constituted an attack to the whole doctrine of formal discipline and gave origin to the famous theory of "identical elements." They will be reviewed more in detail, following in part the comprehensive analysis made by Orata on "The Theory of Identical Elements" (27).

One of the first experiments conducted by Thorndike and Woodworth (41) aimed to determine "The influence of training in one mental function upon the efficiency of other functions." They investigated the influence of special training in the estimation of magnitudes on the ability to estimate magnitudes of the same general sort. Before and after this practice the subjects were tested in estimating the areas of triangles of different sizes. The authors concluded that

The transfer effects obtained were due, as far as the authors could discover, to specific methods, ideas and useful habits that were carried over from the practice series to the after test. . . .There was sometimes a transfer of emotional adjustment.

Similar conclusions were drawn from a second experiment on the influence of practice in observing words which contained certain combinations of letters upon the observation of words containing certain other letters. The authors' conclusion, "which aroused considerable dissent at the time," (41) can be considered as the original formulation of the theory of identical elements;

There is no inner necessity for improvement of one function to improve others closely similar to it, due to a subtle transfer of practice. . . . Improvement in them seems due to definite factors." (41)

Orata (27) reports another method employed by the same authors to study the influence of special training in memorizing on the general ability to

memorize. This gave similar results from which the authors concluded:

The general consideration of the cases of retention or of loss of practice effect seems to make it likely that spread of practice occurs only where identical elements are concerned in the influencing and influenced functions.

Another study reported by the same author (27) deals with findings in relation between accuracy in drawing lines of different lengths. From the relatively low correlations, Thorndike concluded that accuracy of discrimination of length would mean something radically different when the length is 100 mm. from what it means when the length is 50 mm. Other experiments conducted by Thorndike deal with more complex processes, v.g. "Mental discipline in high-school studies." (37)

From these and other studies Thorndike built up the theory of identical elements. He concluded that mental abilities are specific and not general, because (1) transfer is very limited and (2) correlations among mental functions are exceedingly low. Consequently, he thinks, transfer is to be accounted for mainly by the fact that we do over again in new situations what we have learned to do in connection with other situations.

Woodworth (41) proposed a shift in terminology. He suggested that it would be more appropriate to use the word constituent or component in the place of "element." He speaks also of "common factors" but the basic conception of Thorndike seems not to be altered.

The experiments conducted by Judd (17) are important, because the findings led him to propose the "generalization theory" of transfer in place of Thorndike's theory of identical elements. Judd considered that mental functions are closely related and interdependent, and that training in one function necessarily affects other functions. This theory grew out of an experiment on



"The relation of special training to general intelligence." (17) Two groups of boys practiced shooting at targets under water with a small dart. Both groups learned about equally well to adjust by trial and error to the refraction of light when the target was twelve inches under water. Then one group was taught the principles of refraction of light; the other was not. The target was placed four inches under water and a significant difference was found between the two groups; the boys who had been taught the generalized theory of refraction made fewer errors, and more quickly adjusted to the new situation. As Kingsley (19) reports, a similar experiment was made more recently by Hendrickson and Schoeder (1941), who had their subjects shoot at a submerged target with an air rifle, and obtained results substantially the same.

Not only the transfer of principles, but also the transfer of habits has been investigated. Two studies presented by Davis (11) are those of Bagley and Ruediger. Bagley found that a significant improvement in neatness on papers of arithmetic, due to the continuous inculcation of this habit by the teacher, did not transfer to improvement in spelling and language papers. Ruediger emphasized neatness not only in written work, but as a general ideal to be reached, and found that neatness transferred to other subjects too.

One of the most outstanding works on transfer of training was that of George Katona (18), who undertook an exhaustive study with large number of human subjects in school and in lifelike situations and attempted to compare meaningful with senseless learning. He used geometric puzzles and card-matching performances. One group received no practice being used as control group. Of the two experimental groups one was instructed to memorize the solution; the other was taught the principles back of the solution. The percentage of

perfect solutions to new puzzles was much higher for the group which learned the principles. Katona concluded that in meaningful learning "100 per cent is the rule, not the exception; it is almost the midpoint of the distribution"; meaningful transfer occurs, while senseless learning does not transfer. Learning is primarily a process of reconstruction and not a mechanical affair.

In his comprehensive critical study mentioned above, Orata (27) evaluates the two chief theories of transfer. He severely criticizes some of the methods, results, and conclusions of Thorndike. Orata reports Rugg's survey of thirty transfer experiments prior to 1916. They showed that while 51.05 per cent gave either slight or no transfer, 23.25 per cent of the experiments indicate clear evidence of considerable transfer. Orata made a similar study of a great many experiments made from 1890-1940. The results of this study are presented in Table II.

TABLE II

STATISTICAL RESULTS OF TRANSFER EXPERIMENTS FROM 1890 to 1940  
(After Orata)

Amount of transfer claimed	1890-1927		1927-1935		1935-1940		Total	
	N	%	N	%	N	%	N	%
Clear evidence of transfer	81	81	50	73	33	77	164	78
Very little, no transfer, ambiguous, interference, etc.	19	19	18	27	10	23	47	22

Coming to the correlations among mental functions, the same author (28) claims that he has examined most of the studies that have been made and obtained the following consensus of relationship among mental functions: of the correlations, 61.5% are high, 15.4% are appreciable, and only 23.1% are low. On this basis and the results of his survey on the amount of transfer, Orata questions Thorndike's opinion that abilities are highly specific and not general. In the interpretation of these findings, Orata (27) substantially agrees with Rugg, who writes:

By one school of specialists, training has been regarded as specific in effect and transfer has been explained as due to identical ability conditioning factors. However, the typical attitude taken today is that practice may be generalized and transferred through such factors as (1) ideational factors, (2) attention factors, (3) attitudinal factors. Thus, transfer is possible with central functions through the generalization of various ones of these factors.

From his extensive review of experimental results and their interpretations Orata (27) concludes:

While some experts, viz., Thorndike, Poffenberger, Lewis, Knight and Setzafault, Sleight, and others, find that mental functions are highly specific, there is enough evidence from other investigators, Ruger, Rugg, Judd, Coxe, Meredith, Woodrow, Colvin, etc., to show that much functions can be generalized if appropriate techniques and method of control of conditions are used.

The studies which have been reviewed give a sufficient idea of the general trends of the investigations in the field. The early interest of research workers concentrated upon relatively simple skills in the sensori-motor area and cross-education. Some higher functions, such as memory, principles, attitudes were also investigated. Several studies found transfer through increased power of attention. So, as Orata (27) remarks, Coover speaks about "control of attention, in degree, and in duration of concentration," Klines talks about "concentration of attention," and Eber and Meumann about "general

improvement of attention and will power."

The present study, supplementing these studies, aims to investigate whether or not some transfer occurs from phonics drill sessions to verbal and non-verbal items in the Kuhlmann-Anderson intelligence tests.

## CHAPTER III

### THE MEASURING INSTRUMENTS

The following materials were used in securing data for the present investigation: the Bremner-Davis phonics drills, entitled "Sound Way to Easy Reading" (5) and the Kuhlmann-Anderson intelligence tests, Form D (22). These two instruments will be described in this chapter.

The phonograph records used were the Bremner-Davis with individual pupil charts corresponding to the recordings. The series of drills begins with a sound alphabet and proceeds through consonant sounds, short and long vowels, blends, and word analysis. The printed words are illustrated with pictures of the objects represented by the words. While the "key-word" is pronounced on the records, the attention of the pupil is directed not only to the phonic element being taught, but also to the visual element and the word on the sheet.

The Kuhlmann-Anderson tests were first published in 1927, and have been repeatedly revised and restandardized. Finally the sixth edition with several important improvements was printed in 1952 (22). The tests were devised to constitute a measurement of the mental development of school children and young people (22). In its present form the scale contains thirty-nine tests, organized in nine separate booklets which partially overlap each other. Form D, used for the present study, is designed for fourth grade children and contains tests 15-24. As a matter of fact, Form D is the only one which consists of five verbal and five non-verbal subtests; this balanced

distribution of the material is a valuable characteristic for the purpose of the present research. According to the manual, Form D fits best with nine-year-olds or fourth grade.

It can be safely concluded, with Segel (32), that a wide and constant use of the K-A tests, as reviewed in the literature, and the statistical evidence proposed by the authors on the validity of the test, are acceptable indices concerning intelligence tests for the purpose for which such tests are now used in schools.

As to the reliability of the K-A tests, Segel (32) discusses it extensively and says: "The reliability of the tests at various levels shows that the results may be used in the guidance of individual pupils." The consistency of the K-A is specially due (1) to the right degree of difficulty for the mental level at which it is used, and (2) to the median mental-age method used in scoring. The master manual reports that Hilden and Skeels conducted an experiment testing 765 boys eight to twenty years of age, and concluded that the K-A intelligence tests gives

less variability, greater consistency, less extreme deviation, and a smaller probable error of estimate than another group test and an individual test of mental ability.

## CHAPTER IV

### THE PROCEDURE

In the design of transfer experiments two general methods have been used: the first is called the fore- and after-test method and is more obvious for experimenters in the human laboratory; the second is the successive-practice method, more commonly used in animal laboratories, though both were first used on human subjects.

For the present study the first method was employed, which can be simply described this way: supposed two tasks A and B, the subjects are practiced in task A, and before and after this practice they are tested in task B. The question is whether subjects show an improvement or a deterioration from the pre-test to the post-test in task B, and whether this improvement or deterioration can be attributed to practice in task A. Specifically for this research, task A is the phonics drill sessions and task B the performance on the K-A tests, in order to find out whether or not the latter shows any positive transfer that can be attributed to the intervening practice on the phonics drill.

A better performance on task B in the after-test does not necessarily mean transfer of training; some practice effect is to be expected in the post-test, when task B has been previously performed in the pre-test. To obviate this difficulty a control group should be secured to take the fore-test and the after-test like the experimental group, but without the intervening practice on

task A. A net gain attributable to practice can then be obtained by subtracting the gain of the control group from that of the experimental. This general design, as applied to the present study, can be graphically represented:

EXPER. GROUP:	PRE-TEST IN THE K-A	PHONICS SESSIONS	POST-TEST IN THE K-A
CONTROL GROUP:	PRE-TEST IN THE K-A		POST TEST IN THE K-A

The sample used in the present research contained many Negroes, Puerto-Ricans, Mexicans, and other nationalities from a lower socio-economic area of Chicago. More than the average number of handicapped readers was present in this population, as demonstrated in the study conducted by Luser et al.

(23, 34). The subjects were 214 fourth graders with a sprinkling of third graders from two parish and two public schools. At the time of the present study 213 booklets were available, of which 104 belonged to the experimental group and 109 to the control. The procedure followed in the original experiment is described by Luser et al. (23) this way:

After the pretests, each of the four experimental rooms received 43 twenty-minute sessions of phonics drill with the phonograph records and individual pupil charts. These sessions were spaced three times a week for a period of 15 weeks. The experiment was limited to 15 weeks because the pretest had to wait for mid-year promotions, and the retests had to be completed before final examinations in June. No special motivation was given during the drill periods, aside from the encouragement offered in the records themselves.

The complete battery of tests was given to the entire population by the same examiners after the experiment. The recommended instructions for correcting and scoring presented by the manual of the K-A (22) were carried out in explicit detail. The correct number of responses on the test page was counted and then converted into mental ages, according to the tables of the scoring key folders provided with the manual.



Next in line was the calculation of median mental age on the ten subtests for each subject according to the usual procedure for the K-A. The mental age used in computing the pupils' I.Q. is the median mental age of the ten subtests. The results of this study conducted by Luser et al., (23) as far as the IQ scores are concerned, were presented in Table I, page 5.

For the study of transfer, the present writer separated subtests into two categories: verbal and non-verbal. Accordingly five subtests were accepted as manifestly verbal; these were 18, 21, 22, 23, and 24, while the remaining five --15, 16, 17, 19, and 20-- were taken as non-verbal.

Vocabulary and reading ability play an important part in most intelligence tests. But a test which is exclusively verbal has a disadvantage in the fact that the scores are too much determined by the familiarity with language. It would be wrong to interpret a low score on such a test as lack of mental ability. To solve this problem the K-A uses predominantly non-verbal material in the lower levels and combines a good proportion of verbal and non-verbal at the higher grades. Form D of the K-A has exactly the ideal proportion for the present study with five verbal and five non-verbal subtests. So the present writer separated subtests by the above criterion, thus yielding a total of the eight different measures enumerated below:

Experimental group: 1-- Pre-test verbal

2-- Post-test verbal

3-- Pre-test non-verbal

4-- Post-test non-verbal

Control group: 5-- Pre-test verbal

6— Post-test verbal

7— Pre-test non-verbal

8— Post test non verbal

The most important part of the study is the treatment of the data in order to test the significance of the means between pre-test and post-test scores and to compare the net gains of the experimental group with those of the control.

For this purpose a coefficient of correlation had to be secured first. So the Pearson product-moment correlation coefficient was secured, as presented by McNemar (25). Then the significance of the differences between means was calculated by the  $t$  technique corrected for test re-test of the following four groups: verbal experimental, non-verbal experimental, verbal control, non-verbal control.

The formula used for test re-test of the same population was

$$\underline{t} = \frac{DM}{D} \qquad D_M = \frac{2}{M_1} \frac{2}{M_2} - (2r_{12} \times M_1 \times M_2)$$

The formula used to test the significance of differences between experimental and control was:

$$t = \frac{D}{n_D} \qquad n_D = \frac{2}{n_E} \frac{2}{n_C}$$

## CHAPTER V

### THE RESULTS

This chapter will present the statistical results and will comment on certain points of interest found in this study.

Table III lists the results found in the calculation of the means, standard deviations, and differences in scores on the pre-test for the four groups which had to be correlated: verbal experimental, non-verbal experimental, verbal control, non-verbal control.

All the data are given in mental ages, but the fact that they have been divided into two component parts (verbal, non-verbal) for the purpose of this study should be taken into account for the correct interpretation of the scores. Actually this procedure reduces the mental age scores to half their real value.

TABLE III

TEST SCORES IN MEAN MENTAL-AGE MONTHS FOR EXPERIMENTAL AND CONTROL GROUPS BEFORE AUDIO-VISUAL PHONICS DRILL SESSIONS

Subtests	Experimental (N=104)		Control (N=109)		Differences in scores
	Mean	S.D.	Mean	S.D.	
Verbal	38.04	8.98	38.27	8.04	0.23
Non-verbal	42.74	7.00	44.04	6.02	1.30

The fact should be mentioned that the criterion for the selection of the experimental group was the slightly lower average IQ in the pretest with the K-A. As it can be seen in Table III, the M.A. was 38.04 for the verbal subtests in the experimental group as compared with 38.27 for the corresponding sub-tests in the control, which yields a small difference of .23. For the non-verbal subtests in the experimental group the score was 42.74, as contrasted with 44.04 for the control, the difference being 1.30.

Table IV reports the coefficient of correlation between the pre-test and the post-test scores for the four groups. It can be observed that the correlation coefficients are higher for the experimental group in both verbal and non-verbal items. The experimental group correlated .67 in the verbal subtests, while  $r = .57$  for the verbal items in the control group. In the non-verbal subtests the experimental group correlated .55, while a lower  $r = .36$  was found for the control group.

TABLE IV

PRODUCT-MOMENT CORRELATIONS BETWEEN THE SCORES IN THE  
KUHLMANN-ANDERSON BEFORE AND AFTER PHONICS DRILL

Group	Subtests	Number of cases	r
Experimental	Verbal	104	.67
	Non-verbal	104	.55
Control	Verbal	109	.57
	Non-verbal	109	.36

The findings concerning the differences between the means of the pre-test and the post-test scores for the four groups are considered now. The scores for both verbal and non-verbal sub-tests in each group are presented in Table V (page 25). After these results and some comments on them, the net gains and significances of differences between the experimental and the control group scores, which are the most important, will be treated, and presented in a different Table VI (page 26). For the sake of clarity, these two parts will be treated under two separate headings.

1. Differences between pre-test and post-tests in the four groups:

A. Experimental Group: The difference between means found for the experimental group in the verbal subtests was 6.83. Analyzed by the  $t$  technique ( $t = 9.90$ ) it gives a significance far beyond .001 level of confidence. These results show that phonics drill improves the M.A. scores in verbal material of the K-A far beyond what could be expected only by chance.

An improvement in the verbal sub-tests exclusively could be explained in terms of improved reading ability and a greater comprehension of the printed word. The relationship between reading training and good performance on verbal material of an intelligence test is very understandable. But from the study of Luser et al. (23, 34), it seems that word comprehension alone does not give a full account of the unexpected gains in IQ.

So the most significant finding of the present study seems to be the significant difference found for the non-verbal sub-tests in the experimental group. This was as high as 5.72, which yields a  $t = 9.69$  which is significant far beyond .001 level of confidence, as can be observed in the following table.

TABLE V

PRE-TEST AND POST-TEST SCORES IN MEAN MENTAL AGE MONTHS  
GAINS IN TESTS SCORES AND SIGNIFICANCES OF DIFFERENCES  
FOR THE EXPERIMENTAL AND THE CONTROL GROUPS IN  
VERBAL AND NON-VERBAL SUBTESTS OF THE K-A

Groups	Subtests	Pre-test		Post-test		Gain in test scores	<u>t</u>	
		Mean	S.D.	Mean	S.D.			
Experimental	Verbal	38.04	8.98	44.87	8.35	6.83	9.90	.001
	Non-verbal	42.74	7.00	48.46	5.27	5.72	9.69	.001
Control	Verbal	38.27	8.04	40.18	10.16	1.91	2.32	.05
	Non-verbal	44.04	6.02	46.93	5.46	2.89	4.66	.001

B. Control Group: These results on the experimental group can be compared with the findings for the control group. It was expected that the post-test scores would yield some gains compared with the pre-test. The difference of the means was 1.91 for the verbal sub-tests, which yields a t of 2.32, significant at .05 level of confidence. It is felt that these higher M.A. scores in the control group can be explained as due to the normal intellectual growth of the children during the fifteen weeks that the experiment lasted, to practice effect, and to a better adjustment to the testing situation. The gain of test scores on the non-verbal sub-tests for the control group was 2.89, which gives a t = 4.66, significant beyond .001 level of confidence. This gain can also be explained as due to the same factors just mentioned above. So the crucial point of the study is whether or not the experimental group shows a significant improvement over the gains of the control. To this analysis we now turn.

## 2. Net gains and significances of differences between experimental and control group scores.

Even allowing for practice effect, a gain equal to the one shown by the control group in the verbal subtests (1.91), the gain for the experimental is remarkably high (6.83). The net difference in gain for this group in the verbal material was 4.92, which yields a  $t = 4.59$ , still significant beyond .001 level of confidence.

But more important for the present study are the findings about the significant net gains in non-verbal material. It seems opportune to restate here the null hypothesis:

No significant difference between scores on verbal and non-verbal subtests of the K-A intelligence tests can be expected to result from the use of formal phonics drill enriched by audio-visual aid.

The analysis of the data renders ample evidence to refute the null hypothesis. The gain in the non-verbal subtests was 5.72 for the experimental group, while the control group showed a gain of only 2.89. A net gain of 2.83 yields a  $t = 3.33$ , which is again significant beyond .001 level of confidence. These results are presented in table VI.

TABLE VI

NET GAINS AND SIGNIFICANCES OF DIFFERENCES BETWEEN EXPERIMENTAL AND CONTROL GROUPS IN MEAN MENTAL-AGE MONTHS FOR VERBAL AND NON-VERBAL SUB-TESTS AS SHOWN BY  $t$  TEST AFTER PHONICS DRILL SESSIONS

Subtests	Experimental N = 104 Gain	Control N = 109 Gain	Net differences in gain	$t$	P
Verbal	6.83	1.91	4.92	4.59	.001
Non-verbal	5.72	2.89	2.83	3.33	.001

The hypothesis that better attitudes and habits of attention may have been established or aided by phonics drill thus enabling the children in the experimental group to attend more carefully to the instructions given orally for the post-test, seems a satisfactory explanation of these gains. The fact has been clearly demonstrated that there is some transfer of training from the phonics drill sessions to the performance in both verbal and non-verbal sub-test of the K-A, Form D.



## CHAPTER VI

### SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate the effect of group phonics drill on the performance of the non-verbal sub-tests of the Kuhlmann-Anderson intelligence tests. It was felt that if the non-verbal sub-tests were significantly improved, a satisfactory explanation of this fact would be that better attitudes and improved habits of attention, produced by the phonics drill, enabled the children to attend more carefully to the group instructions given orally by the examiner for the K-A, and to a better performance in it.

The null hypothesis proposed was:

No significant difference between scores on verbal and non-verbal subtests of the K-A intelligence tests can be expected to result from the use of formal phonics drill enriched by audio-visual aid.

To test the hypothesis, 213 fourth graders were chosen as subjects from a lower socio-economic area. The subjects were administered the K-A intelligence tests, Form D, before and after the experiment. In each of the four schools an experimental and a control group were selected. The experimental group received forty-three drill sessions in phonics, spaced three times a week for a period of fifteen weeks. On the re-test with the K-A the experimental group showed an unexpected gain in I.Q.

The analysis of the data consisted in comparing the performance between pre-test and post-test by means of the t technique, in each of the following groups: verbal experimental, non-verbal experimental, verbal control, non-verbal

control. Using also the  $t$  test the net gains and significances between control and experimental group was tested for verbal subtests as well as for non-verbal.

The  $t$  test rendered ample evidence to reject the null hypothesis. The effectiveness of the phonics drill for both the verbal and non-verbal sub-tests was demonstrated in table V (page 25). Net differences in gain between the experimental and the control groups were significant beyond .001 level of confidence (Table VI).

The fact that the phonics drill improved the performance on the verbal material can be partially attributed to fuller comprehension ensuing from increased facility in reading. But the experiment made the fact clear that phonics drill improved significantly the non-verbal scores too. It seems that a transfer of training of common elements has taken place here. The hypothesis about improved habits of attention from phonics drill seems a reasonable explanation of this significant gains in the non-verbal material.

It appears that group phonics drill has a positive beneficial value for fourth graders not only in increasing their mastery of reading but also in the attention to group instructions given orally on the second administration of the K-A intelligence tests.

## BIBLIOGRAPHY

1. Agnew, D.C., The Effect of Varied Amount of Phonetic Training on Primary Reading. Durham: Duke University Press, 1939.
2. Allen M., The relation between KA tests and achievement in grade four. Journal of Educational Psychology, 1944, 35.
3. Anastasi A. Psychological Testing. New York: Macmillan, 1959.
4. Bray, C. W., Transfer of Training, Journal of Experimental Psychology, 1928, 11, 443-467.
5. Bremner, A.J., & Davis, J. The Sound Way to Easy Reading. Wilmette, Ill.: Bremner-Davis Phonics, 1953.
6. Cabanski, Carolyn M. Luser. "The predictive value of the individual Kuhlmann-Anderson subtests regarding reading improvement." Unpublished Master's Thesis. Loyola University, Chicago, 1959.
7. Cook, T. W., Studies in cross-education: mirror tracing the star shaped maze I and II, Journal of Experimental Psychology, 1933, 16, 144-160, 679-699.
8. Coover, J. E., and F. Angell, General practice effects of special exercise, American Journal of Psychology, 1907, 18, 328-340.
9. Craig, Robert C., The Transfer Value of Guided Learning. New York: Bureau of Publications, Teachers College, Columbia University, 1953.
10. Cronbach, Lee J. Essentials of Psychological Testing. New York: Harper Brothers, 1960.
11. Davis, Robert A., Psychology of Learning. New York: McGraw-Hill Book Company, Inc., 1935.
12. Dorsey, M.F., and L.T. Hopkins, The influence of attitude upon transfer. Journal of Educational Psychology, 1930, 21, 410-417.
13. Gibson, E., Improvement in perceptual judgments as function of controlled practice of training. Psychological Bulletin, 1953, 50, 401-431.

14. Gray, W.S. The Teaching of Reading and Writing, Chicago: Unesco, Scott Foresman and Company, 1956.
15. Hovland, C. I. "Human Learning and Retention." Handbook of Experimental Psychology, New York: Wiley, 1951.
16. James, W. Principles of Psychology, New York: Longmans Green, 1890.
17. Judd, C.H. The relation of special training to general intelligence. Educational Review, 1908, 36, 28-42.
18. Katona, G. Organizing and Memorizing. New York: Columbia University Press, 1940.
19. Kingsley, H. L. The Nature and Conditions of Learning. New York: Prentice-Hall, 1946.
20. Kuhlmann, F.A. A median mental age method of weighing and scaling tests. Journal of Applied Psychology, 1927, 11, 181-198.
21. Kuhlmann, F. The Kuhlmann-Anderson intelligence tests compared with seven others. Journal of Applied Psychology, 1928, 12, 545-594.
22. Kuhlmann, F. & Anderson, R. G. Kuhlmann-Anderson master manual. Princeton: Personnel Press, 1951.
23. Luser, C., Stanton E., & Doyle, C.I. Effect of an audio-visual phonics aid in the intermediate grades. Journal of Educational Psychology, 1958, 49, 28-30.
24. McClear, E.V. "An experimental study of the effect of the introduction of an intelligence factor in a problem of the motor learning type," Unpublished Master's Thesis. Loyola University, Chicago, 1938.
25. McInemar, Q. Psychological Statistics, New York: Wiley, 1949.
26. Munn, N. L. Bilateral transfer of learning. Journal of Experimental Psychology, 1932, 15, 343-353.
27. Orata, P. T. The theory of Identical Elements. Columbus: Ohio State University Press, 1928.
28. Orata, P. T. Recent research studies on transfer of training with implications for the curriculum, guidance and personnel work. Journal of Educational Research, 1941, 35, 81-101.
29. Osgood, C.E. Method and Theory of Experimental Psychology. New York: Oxford University Press, 1953.

30. Plato, The Republic, 525, tr. J. L. Davies & D.J. Vaughan. Cambridge: McMillan, 1858.
31. Sandiford, P. "Transfer of Training," Encyclopedia of Educational Research. New York: 1941.
32. Segal, D. "K-A Intelligence Tests, Sixth Edition," The Fourth Mental Measurement Yearbook. Highland Park: Gryphon Press, 1953.
33. Spache, G. Deriving language and non-language measures of IQ from K-A intelligence tests. Journal of Educational Psychology, 1941, 32, 673-680.
34. Stanton, E. "The effect of an audio-visual phonics aid in the intermediate grades," Unpublished Master's Thesis. Loyola University
35. Thorndike, E.L. & R.S. Woodworth. The influence of improvement in one mental function upon the efficiency of other functions. Psychological Review, 1901, 8, 247-261, 384-295, 553-564.
36. Thorndike, E.L. Influence of first-year Latin upon range of English vocabulary, School & Society, 1923, 17, 82-84.
37. Thorndike, E.L. Mental discipline in high-school studies, Journal of Educational Psychology, 1924, 15, 1-22, 83-98.
38. Thorndike, E. L. The Psychology of Learning, New York: Teachers College, Columbia University, 1926.
39. Traxler, Arthur E. Ten years of Research in Reading. New York: Educational Records Bureau, 1941.
40. Woodrow, H. Effect of type of training upon transference. Journal of Educational Psychology, 1927, 18, 159-172.
41. Woodworth, R.S. & Harold Schlosberg, Experimental Psychology. New York: Henry Holt & Company, 1954.

APPROVAL SHEET

The thesis submitted by Alvaro Jimenez, S.J. has been read and approved by a board of three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

June 1, 1961

Date

Charles L. Doyle, S.J.

Signature of Adviser

(PK)